anti-parallel to the first direction, when the second ferromagnetic free layer is in a quiescent state;

a spacer layer between the first and second ferromagnetic free layers; and

a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface (ABS) and producing a bias magnetic field that biases both M_1 and M_2 in a third direction that is transverse to the first and second directions thereby establishing quiescent bias states for M_1 and M_2;

wherein M_1 produces a first demagnetization field that biases M_2 in the second direction and M_2 produces a second demagnetization field that biases M_1 in the first direction when the first and second ferromagnetic free layers are in their quiescent states, and M_1 and M_2 rotate about their quiescent bias states in response to an applied magnetic field thereby producing a GMR effect in the sensor as a function of the rotation of M_1 and M_2.

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9. (Amended) A method of sensing an applied magnetic field, comprising steps of:

(a) providing a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned with a sense current (I) in a longitudinal direction, when in a quiescent state;

(b) providing a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction, when in a quiescent state;

(c) applying a bias magnetic field to the first and second ferromagnetic free layers with a biasing

component thereby angling M_1 and M_2 toward a third direction that is transverse to the first and second directions and establishing a quiescent bias state, wherein the biasing component is either a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface, or a first anti-ferromagnetic layer exchange coupled to the first ferromagnetic free layer and a second anti-ferromagnetic layer exchange coupled to the second ferromagnetic free layer; and

(d) allowing M_1 and M_2 to rotate about their quiescent bias states in response to an applied magnetic field whereby a GMR effect is produced as a function of the rotation of M_1 and M_2.